

*With the Author's Compliments to*  
**DIXON (J.)** 566

A Lecture

ON

DIARRHŒA AND CHOLERA,

THEIR NATURE, SYMPTOMS, TREATMENT,  
AND PREVENTION.

BY

JOHN DIXON, M.D.,

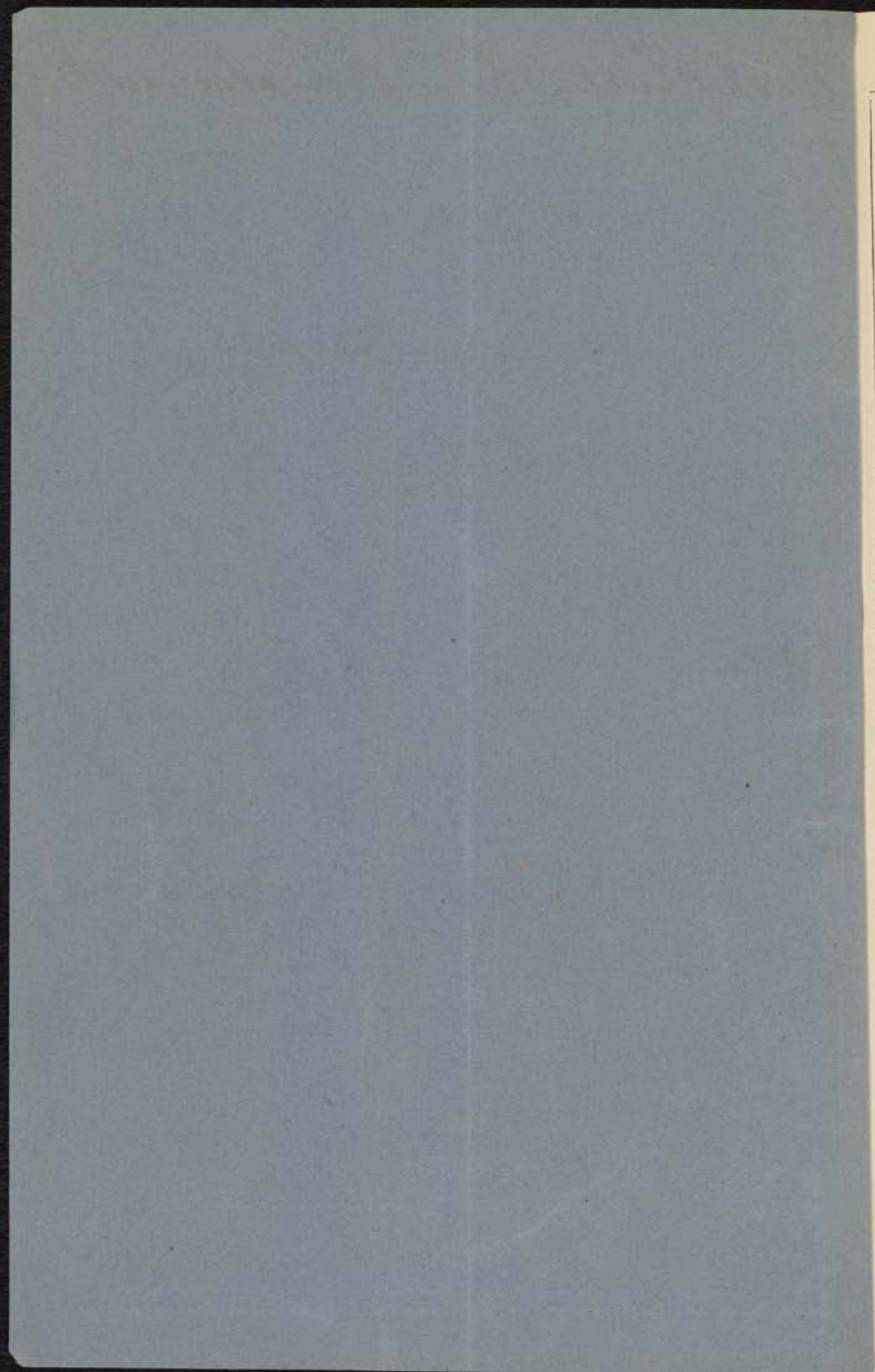
*Licentiate of the Royal College of Physicians of London;  
Member of the Royal College of Surgeons of England; L.S.A.; and L.M.;  
Surgeon to the Surrey Dispensary, &c.*

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PRICE SIXPENCE.  
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LONDON:

HENRY RENSHAW, 356, STRAND.

1871.



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1871.

1890

# DEATHS

THE DEATHS OF THE YEAR 1890

AND THE CAUSES THEREOF

AS REPORTED BY THE

REGISTRARS OF DEATHS

IN THE DISTRICT OF

THE METROPOLIS

FOR THE YEAR 1890

BY

## PREFACE.

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As pupil to a Poor Law Surgeon in 1848-9, and as Poor Law Medical Officer of a populous district in 1854 and 1866, the author has had some experience of Cholera during three visitations of that disease. The following Lecture was delivered at Bermondsey on the 12th of October, 1871, with the object of strongly impressing upon the public the importance of adopting sanitary measures *before* Cholera again makes its appearance amongst us, and the necessity of using disinfectants in *every* case of Cholera which may occur.

"The Precautions against Cholera," issued by the Medical Department of the Privy Council, and "The Oxford Minute on Disinfection," are reprinted at the end, with the view of giving the utmost publicity to the valuable suggestions which they contain.

108, Grange-road, Bermondsey,  
October, 1871.

*Deaths from Diarrhœa and Cholera in London.*

Year.	Diarrhœa.	Cholera.
1858	2093	130
1859	3335	198
1860	1383	46
1861	2625	168
1862	1735	107
1863	2448	154
1864	2861	154
1865	3557	193
1866	3184	5577*
1867	2942	240
1868	4060	320
1869	3400	217
1870	3776	235

\* Including epidemic cholera.

A LECTURE  
ON  
DIARRHŒA AND CHOLERA.

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THE singular and mysterious disease known as ASIATIC, EPIDEMIC, or MALIGNANT CHOLERA is said to be described in the ancient medical writings of the Hindoos; yet it is believed that, prior to August, 1817, it never assumed the malignant type and epidemic form which then and since have characterised its progress. In that year the pestilence first appeared at Jessore, a populous town situate on the delta of the Ganges, about 100 miles north-east of Calcutta, from whence it gradually spread through all the presidencies of India, visiting the Mauritius, China, Ceylon, Arabia, and Persia; subsequently invading Tartary, Russia, and Germany, and first appearing in this country at Sunderland, on the 26th day of October, 1831. The first cases reported in London occurred on the 13th of February, 1832, at Rotherhithe and Limehouse. During that epidemic 6536 persons died of the disease in London, of which 210 died in Bermondsey, or 7 per 1000 of the population. The next epidemic occurred in 1849, when 14,136 deaths were caused by cholera, of which 734 happened in Bermondsey, or 16 per 1000 of the population. The metropolis was again visited in 1854, when 10,675 persons fell victims to the disease, of which 834 were inhabitants of this parish, or 17 per 1000 of the population. In July, 1866, the mortality of London was doubled by an explosion of Cholera, although the ravages of the disease were principally confined to the east end of London. The deaths from Cholera in that year were 5577. Only a few cases occurred in this neighbourhood. During the present year this fearful malady has been prevailing in Russia and Germany, in places which are within a week's journey from our shores, so that

we have some reason to apprehend another invasion of the disease.

Have we sufficiently profited by the experience of the former visitations, and are we prepared to meet the next as we ought? I fear not. It is true that we are better prepared than we were on any previous occasion, but much remains to be done. The public mind has become awakened to the fact that much of the destructive effects of this formidable pestilence is the result of circumstances which can be avoided by human foresight, and by greater attention to the conditions by which the life of the community is regulated. The measures which are most serviceable in arresting the spread of Cholera are also those which tend to prevent other forms of preventible disease. Hence there is reason to believe that this fearful disease, by forcing sanitary legislation on the country, and exciting our local sanitary boards to action, has been the means of saving some thousands of lives annually, and, in the course of years, of preserving more persons than it has destroyed. It appears to me that the best method of avoiding any panic on this subject is to look the matter full in the face at once, and to diffuse all the information we possess in relation to it. The great evils with which we have to contend are apathy and ignorance. The Government is slow to exercise its powers, and does little beyond giving instructions, and appointing inspectors to collect the materials for a Blue Book. The local Boards of Health too often wait for the actual presence of a serious pestilence to induce them to carry out, at least for a time, and often at an enormous cost, those duties which might easily have been performed before, at less expense and with greater advantage. The public again, even among the educated classes, expect the Local Boards to do for them what they ought to do for themselves. The poor and uneducated rarely think of adopting the preventive measures recommended by the medical officers of health, until *after* some contagious disease has actually occurred in the house, and not even then until a sufficient length of time has elapsed to allow the disease to produce all the mischief of which it is capable. When this has been done, and a death has been registered, the parish authorities have the premises lime-washed and fumigated, and thus the cases are *followed* from house to house. The saving of human life is not only an act



of humanity—it is a religious, a social, a patriotic duty. Economical considerations, instead of leading us to disregard the teachings of sanitary science, should induce us to follow them with promptitude and energy. The life of a poor labouring man is a source of wealth to the country, while his untimely death often entails heavy burthens on others. Widows and orphans suddenly find themselves in a state of pauperism, which is rarely recovered from. They become habituated to idle dependence, and it has been found that even when the children grow up, leave the poorhouse, and marry, their habits are improvident, and they frequently relapse into the conditions under which they were reared.

The infant mortality amongst the poor is about in the proportion of five, to two amongst the rich. In proof of the importance of drainage, the case of Leicester may be cited. The average age at death in the drained streets was found to be  $23\frac{1}{2}$  years; that in streets partly drained,  $17\frac{1}{2}$ ; that in streets entirely undrained,  $13\frac{1}{2}$  years. Dr. Lankester calculates that the adoption of proper sanitary arrangements would save the nation some ten million pounds worth per annum of valuable workpeople's lives.

It is evident that "saving the rates" is best accomplished by a timely and judicious expenditure.

Infectious diseases originating in the filthy, over-crowded and neglected dwellings of the poor, may carry destruction and death to the mansion and the palace. Neglect of some apparently trivial and unimportant thing, as leaving the drain of a sink untrapped, or the careless disposal of household slops, may be productive of most serious consequences. I trust these preliminary remarks are sufficient to point out to you the importance of an acquaintance with sanitary science, and the duty of inducing others to carry out those measures which tend to prevent disease. I shall now make a few observations on a very common disease which is mainly due to preventible causes, but from which nearly 20,000 deaths are annually registered in this country, viz., Diarrhœa; after which I shall consider the more serious, but happily rare disease, known as Epidemic Cholera.

DIARRHŒA is a complaint of such frequent occurrence, and its general symptoms are so well known, that a detailed description is unnecessary. It is often a symptom or an effect of some other disease or condition, rather than a disease

of itself. The word *Diarrhœa* is merely a professional term for looseness of the bowels, arising from disorder in the small intestines or upper portion of the bowels, and giving rise to more frequent, more copious, and more liquid evacuations than natural. It may be associated with flatulence, pain in the bowels, and sickness, but these symptoms are not necessarily present. The discharges from the bowels may be of a feculent, bilious, mucous, serous, or watery character, and each of these distinctive terms has been used to confer a specific name on certain forms of the disease, as bilious diarrhœa, mucous diarrhœa, &c., but in practice it is found that one form passes into another. A moderate relaxation of the bowels may be beneficial in removing irritating substances from the bowels, or as the means employed by Nature in purifying the blood from some noxious matter; but if the disorder is protracted it becomes hurtful to the system, by impoverishing the blood, and producing a state of exhaustion which may terminate fatally. In seasons when epidemic cholera is prevalent it is important that no case of diarrhœa should be neglected, however slight, painless, or trivial in its nature it may appear to be. To enumerate the various causes which give rise to this complaint, is, in a great measure, to suggest the means of prevention and the proper remedy. In the first place, it is often caused by indigestible food, as pork, salt beef, minced veal, mussels and other shell fish, skins of fruit, unripe fruit, &c. One of the most common causes of diarrhœa in young infants is the use of bread, gruel, biscuits, &c., instead of milk, and making the food too thick, instead of endeavouring to make the best possible imitation of the mother's milk, which can be done by diluting good new cow's milk with one-third of water, and sweetening it with a little sugar of milk, or condensed Swiss milk, which answers the same purpose. Sugar of milk is less likely to cause acidity and flatulence than loaf sugar. A dirty, sour feeding-bottle is also a frequent cause. Indigestion of wholesome food may arise from excess, from rapid eating or bolting the food, from making a hearty meal when exhausted by fatigue, or from violent exercise taken soon after a meal. Tainted meat and impure water are well-known causes of diarrhœa. It may also arise from irritating secretions, as vitiated bile being poured into the bowels, or from the irritation produced by intestinal worms, &c., or

even as the result of constipation and a neglected state of the bowels. In the second place, the diarrhoea may be due to certain constitutional derangements, as teething, scrofulous diseases, consumption, kidney and liver complaints; to inanition from insufficient food; to debility from loss of blood; and as a consequence of fever, small-pox, measles, scarlatina, and exhausting diseases generally. Thirdly, we find diarrhoea arising from the effects of heat, cold, damp, impure air, decomposing organic matter in the food or water, malaria, and unknown atmospheric influences. Some of these last-named causes may act on the nervous system and others on the blood. From what I have stated you will readily understand that diarrhoea is sometimes merely a symptom and consequence of another, which is the real disease, and at other times diarrhoea may be classed as one of the zymotic diseases which prevail epidemically from time to time, and which are preventible to a great extent by attention to sanitary matters. You will also perceive that there can be no specific remedy equally applicable to all cases.

The *treatment* consists in the avoidance or removal of the exciting cause as far as practicable; rest in bed or in the recumbent position; warm flannel to the abdomen; and a light, digestible, but nutritious diet, given in moderate quantities. The kind of medicine most suitable will depend on the nature and stage of the complaint and the condition of the patient. When irritating matters require to be removed, a moderate dose of castor oil, or tincture of rhubarb, or Gregory's Powder, will answer the purpose. When there is acidity, chalk, or carbonate of soda, or sal volatile will serve to neutralise it. When there is depression or exhaustion, aromatics and stimulants, as brandy, ether, camphor, and ammonia, are proper remedies. Laudanum and other preparations of opium relieve pain and quiet the action of the bowels. This class of remedies should never be given to children except under medical advice. In the more advanced stages of the disorder there are various astringent medicines which may be administered with advantage. Tonics are often required during the period of convalescence. In cases of Chronic Diarrhoea change of air is a very valuable means of cure. I have been in the habit of recommending children suffering from intractable diarrhoea to be taken from

Bermondsey to Blackheath for a few hours every day, and with the most beneficial results.

In summer and autumn, when the temperature of the air is much above the average for several days, children under two years of age are very liable to suffer from severe diarrhœa of a watery character, with great prostration, or even collapse. Many of these cases terminate fatally. This complaint is often called INFANTILE CHOLERA. Early treatment is most essential, and yet children are frequently taken to the doctor for the first time when they are in a dying state, just to ask, "if there is any danger!"

ENGLISH CHOLERA, or Cholera Morbus, prevails to a greater or less extent every autumn. It is attended with violent vomiting and purging of bilious matter, much pain in the stomach and bowels, more or less spasm or cramps about the muscles of the abdomen and extremities, and great prostration of strength. If the disease be not arrested the patient may die within twenty-four hours, but it is seldom fatal if *early* and properly treated. It appears to arise from the heat of the weather causing the secretion of an excessive amount of unhealthy and irritating bile. Excess of food, the use of unwholesome food—as bad oysters, cheap sausages, under-cooked pork, &c.—and intemperance, may all be considered as exciting causes. It is not communicable to other persons. The most severe forms of this disease do not present the peculiar symptoms which are characteristic of Indian Cholera, which we have now to consider.

EPIDEMIC CHOLERA—which has also been termed Asiatic, Indian, Malignant, Pestilential, and Spasmodic Cholera, and Cholera Asphyxia—is *not* an aggravated or epidemic form of the ordinary Autumnal Cholera, but a disease *sui generis*, which appears to have its natural habitat in the marshy districts of India, and is capable of assuming an epidemic character, and of being propagated and communicated from place to place and from person to person under certain conditions. Its course is generally westward from India, along the leading tracks of commerce, and the banks of great rivers, attacking city after city in rapid succession, and proving fatal to large numbers of those who are attacked. It falls most heavily on those towns, places, or houses where deficient ventilation and drainage, accumulation of putrescent matters, want of personal cleanliness, and intemperance

are most prevalent. In London the mortality from Cholera has been in proportion to the height of the districts above the level of the Thames. "The mortality was at the rate of 156 per 10,000 in the lowest districts, viz., Newington, Rotherhithe, St. George's, Southwark, and Bermondsey, about the level of the Thames; and 15 per 10,000 in the highest, viz., Hampstead, Islington, Marylebone, and St. Pancras." However, in India, places situate 7000ft. above the sea level have not been exempt from severe visitations. It has been most severe in those localities where the water supply was the most impure, and evidently in proportion to the amount of such impurity. "Mr. Simon has given us a statement of the mortality among the consumers of water supplied by two companies drawing their water from distinct sources, but distributing it in the same district, at the same time, and among the same class of people, the pipes of the two companies being laid pretty evenly in the same areas, in many places running side by side in the same streets, and the houses supplied pretty equally distributed. The water companies were the Lambeth Water Company and the Southwark and Vauxhall Water Company. The first drew their supply at Ditton, above the influence of the London sewage and tidal flux, the last from the river near Vauxhall and Chelsea. The Lambeth supply was tolerably pure, the Vauxhall company's very impure. The deaths in the houses supplied by the Lambeth company were at the rate of 37 to every 10,000 living; in those supplied by the Southwark and Vauxhall, at the rate of 130 to every 10,000 living. The population drinking the foul water appears to have suffered three and a-half times as much as that drinking the purer water." The denser the population to the square mile the greater is the comparative mortality. Thus, in a population of 915 to the square mile, the deaths were 65 per 10,000; and in a district of 235 inhabitants to the square mile the deaths were only 7 per 10,000. When the disease appears in any place, those who are most predisposed to it are the first to fall victims to it, and the deaths often amount to two-thirds or even three-fourths of the cases. When the epidemic is at its height about half of the persons attacked die, and, when it is declining, two-thirds or more of the cases recover. The disease probably depends on a specific animal poison, fungus, or contagion germ, which neither the science

of chemistry nor the use of the microscope has succeeded in detecting. This poison appears to be germinated in the cholera evacuations in the course of a few hours after they have been passed, of ascending into the air and being borne to a distance, of attaching itself to articles of clothing and other movables, and thus being conveyed from place to place. It also appears to be capable of propagating itself either in air or in water when these are contaminated with organic impurities in a decomposing state. No other theory so satisfactorily explains the course of the pestilence and the well marked instances of its propagation. Hence the absolute necessity of disinfecting *all* the discharges and clothing of a cholera patient, and the observance of strict personal cleanliness on the part of the attendants, and the great importance of pure water and free ventilation. The disease does not depend upon atmospheric conditions, although certain states of the air—as a dense atmosphere charged with heat and moisture—may favour the germination or diffusion of the poison, or increase the susceptibility of individuals. Dr. Goodeve, an eminent authority on this subject, says :—“Neither climate, nor season, nor earth, nor ocean seem to have arrested its course or to have altered its features. It was equally as destructive at St. Petersburg and Moscow as it was in India—as fierce and irresistible amongst the snows of Russia as in the sunburnt region of India ; as destructive in the vapoury districts of Burmah as in the parched provinces of Hindustan. The opposite states of heat and cold—humidity and dryness, high and low barometric states, &c.—have prevailed or been excluded without banishing the disease.” It has been known to cease after heavy falls of rain, and to decline after a hurricane.

The characteristic features of this disease are :—Vomiting and purging of a fluid resembling water in which rice has been boiled ; cramps of the extremities ; extreme corpse-like collapse ; remarkable reduction of the temperature of the body ; suppression of the secretions of bile and urine ; sense of oppression about the chest ; and its high rate of mortality. If the patient recovers from the collapse he often suffers from a peculiar secondary fever of a typhoid character. If he dies in a state of collapse the body often becomes much warmer after death, and sometimes there are muscular contractions which move the limbs even two hours or longer

after all respiration has ceased. Such is a concise enumeration of the most striking phenomena attending this singular malady. However the importance of the subject demands a fuller description of the symptoms.

A few cases have been recorded in which the patient appeared struck with a violent dose of cholera poison, rapidly passed into a state of extreme collapse, and died in the course of two or three hours without any marked symptom of vomiting or purging. In such cases a large quantity of the peculiar rice-water discharge of Cholera has generally been found in the intestines after death. Such cases, however, are comparatively rare. *In the large majority of instances there is a premonitory stage of diarrhœa, often of a slight and painless character, lasting for a period varying from a few hours to several days.* A feeling of exhaustion and depression of spirits, sometimes attended with headache, giddiness, trembling, and noise in the ears; a pallid, anxious, and sorrowful cast of countenance, have also been observed. The last-named symptom has enabled an acute observer to predict an attack of cholera. There may be little or no pain in the stomach or bowels. The diarrhœa may be slight or copious, of a semi-fluid or very watery character; the evacuations are sometimes pale, but not always so. The necessity of checking such discharges, occurring during cholera epidemics, cannot be too strongly insisted upon. Although the general results of early treatment are apparently favourable, and it is in this stage of the disease that remedies are of the greatest use, it must be confessed that even the early symptoms of this frightful malady sometimes baffle all attempts to prevent them from running on into decided cholera.

The attack, in the severer form of the disease, usually commences with purging—very often early in the morning. Vomiting seldom comes on till later. The first evacuations consist of the ordinary contents of the bowels, mixed with much liquid. These evacuations, which are repeated frequently, and very copious, soon become of a light straw colour, thin, pale, and mixed with small white flaky substances, like washings of meat, or water in which rice has been boiled. With the purging, but generally later, is combined vomiting of a clear watery fluid, often in quantities of a pint or more, and usually ejected with force. There is intense thirst, burning



sensation in the stomach, and great prostration ; paroxysms of cramp affect the fingers and toes, the arms and legs, and sometimes the abdomen. The countenance becomes altered and shrunken. The temperature of the body may become reduced 10 or 12 deg. below the natural standard. The skin is cold, inelastic, and clammy, or covered with a profuse perspiration. The surface of the body assumes a somewhat blueish or leaden hue. The fingers are shrivelled and sodden like the hands of a washerwoman. The eyes are sunken in their sockets, and have a stony, staring look, and are surrounded by a dark circle. The sense of hearing is more obtuse. The voice sinks into a whisper, and is of a peculiar, husky, unnatural character. The tongue and breath are cold. The patient is restless, tosses about, throws off the bedclothes, complains of the heat, and cries for more air—more water. The secretions of bile and urine are suppressed. The pulse is reduced to the faintest thread, or becomes imperceptible at the wrist, and can scarcely be felt in the larger arteries of the arm, thigh, and neck. The intellect retains a remarkable clearness even to the last. There is a complete calmness of mind and entire absence of emotion at the prospect of death. However the sense of oppression at the chest increases, the breathing becomes more and more impeded, the brain more and more torpid, and death slowly closes the painful scene. Or, after lasting for a variable time, from two or three, to four-and-twenty hours, or longer, the state of collapse may be succeeded by signs of reaction. The patient becomes less restless, less thirsty ; anxiety gives way to calm ; the breathing becomes more easy, and the expired air less raw and cold ; the pulse is again felt at the wrist ; the surface of the body is less cold ; the countenance assumes more and more its natural character ; the secretion of urine is re-established, the evacuations are again tinged with bile, and there is a fair prospect of recovery. However, the danger is not yet over ; a relapse may occur, or the reaction may be imperfect, and be followed by fatal exhaustion after three or four days, or consecutive fever may supervene, and the patient may sink after lingering some ten or twelve days. Occasionally the recovery is very rapid, and appears most extraordinary when we consider how much the patient resembled a corpse, in everything but the actual extinction of life, only a few hours before.

I have told you how little we know of the exact nature



of the Cholera poison. We only know of its existence by its effects. It is not my intention to dwell upon the theories which have been brought forward to explain the *modus operandi* of the Cholera poison, and to account for its effect in producing the peculiar symptoms of this disease, because such a course would occupy too much time; and, in order to be fully understood, a more extensive knowledge of anatomy and physiology, and of the meaning of professional terms, would be required than I can expect to meet with in a mixed public audience like the present. However, I feel that a lecture of this kind would be incomplete without some allusion to the labours of Dr. George Johnson. That gentleman repudiates, as inconsistent with the acknowledged facts of the disease, an old theory, which assumed "that what is called the collapse of Cholera is mainly a result of the drain of fluid from the blood through the alimentary canal, and that, in consequence of the discharge of liquid by the stomach and bowels, the blood, deprived of its water, was rendered thick like treacle, and thus incapable of passing freely through the smaller vessels; and thus, as moving blood is the life of the body, if the circulation comes ultimately to a stop, life must stop with it."

So far I perfectly agree with him. It is quite true that the coldness of the body, the blueness of the surface, the impeded respiration, and the suppression of urine, are not sufficiently accounted for by the mere drain of fluid. At the same time I believe that the rapid and extreme loss of the serous portion of the blood has a most injurious effect, and may so interfere with the functions of life as to prevent any further elimination of the poison.

Dr. Johnson's theory is, "that the symptoms of Cholera result from the action of a material poison upon the fluids and tissues of the body—that in whatever way the poison invades the system, whether through the lungs or through the stomach, it enters the blood, and there probably multiplies itself before it gives rise to its characteristic effects; that the vomiting and purging are the results of a conservative effort to expel the poison and its products from the system; that the poisoned blood excites the contractile walls of the minute arteries of the lungs, and this so narrows the arterial canals as to impede the circulation through the lungs, and in extreme cases to arrest it entirely." He states, "If

the poison be so abundant or so virulent as to excite extreme contraction of the pulmonary arteries, it is manifest that while the muscular walls of the heart and the entire nervous system have their functions perilously impaired by the scanty supply of blood which they receive, the poisoned blood, being kept back from the excreting surface of the alimentary canal, cannot be freed from its impurities, and, therefore, a return to health is impossible." He adds that, "during the collapse of Cholera the stream of blood through the pulmonary capillaries being greatly lessened, the supply of oxygen to the system is, in a corresponding degree, diminished. Hence, there is defective oxygenation of the blood and of the tissues, therefore a diminished formation of heat, coldness of the surface, diminished exhalation of carbonic acid by the lungs, and nearly complete suppression of bile and urine." This theory is unquestionably more satisfactory and correct than the old theory, but I do not think it expresses the whole truth; and I venture to suggest that the arrest of the circulation and the accumulation of blood in the right side of the heart, and in the venous system, does not so much arise from a sort of spasm of the pulmonary capillaries obstructing the action of the right side of the heart, as from a paralysis of the right side of the heart itself, in consequence of its not being duly stimulated to action by properly formed venous blood. Otherwise I think pulmonary hæmorrhage or spitting of blood would be a constant symptom, the face would be livid and turgid, the veins of the neck prominent, the eyes protruding, and the general aspect of the patient more like that of a person suffering from asthma than one having the corpse-like appearance of Cholera. Just as the left ventricle of the heart requires the stimulus of proper arterial blood, so does the right ventricle of the heart require the stimulus of proper venous blood. The fault appears to me to be at the opposite extremity of the circulation, and to arise from defective changes in the blood when passing through the systemic capillaries, arising from the effect of the poison on the ganglionic nervous system which governs the functions of organic life, as the brain does those of the intellect, and the spinal marrow those of muscular motion. The heat of the body does not arise directly from the oxygenation of the blood in the lungs, but from the chemical changes which

attend its deoxidation in the systemic capillaries. The coldness of the body and the suppression of the secretions of bile and urine are well-marked symptoms before the respiration is much impeded. You are probably aware that there are certain poisons—vegetable alkaloids—some of which, as morphia, act principally on the brain; and others, as strychnia, which act principally on the spinal nervous system. Some of these appear to paralyse the nerves of sensation, others the nerves of motion. I think it is probable that there will ultimately be found to be animal poisons of the nature of animal alkaloids—probably compounds of albumen and ammonia—which act as poison upon the ganglionic or sympathetic nervous system, and are the cause of various diseases. There are vegetable alkaloids possessing very different effects on the body, which on analysis are found to consist of the same ultimate elements, and often in the same proportions. The only difference which can be imagined is that the same atoms are differently arranged. It is reasonable to suppose that there is a like difference in animal alkaloids, and this would account for decomposing sewage matter being the cause of scarlatina or diphtheria, or typhoid fever, or dysentery, or cholera. It would also account for the difficulty of detecting such poisons by chemical analysis, as their ultimate elements are precisely the same as those which form many harmless organic compounds. I believe the Cholera poison is something of this class. Some persons have thought it to be a miasmatic vapour or gas. It may possibly be a living germ—a species of microscopic fungus or an animal cell—capable of growth and multiplication under certain favourable conditions which are indispensable to the preservation of its vitality, and which conditions may only prevail for a limited period. This theory would help to account for the sudden decline and entire disappearance of an epidemic. The poison, whatever it is, does not appear to be given off from the lungs or the skin of the patient. It is doubtful whether it exists in the recently passed or in the thoroughly decomposed evacuations of Cholera patients, but there is every reason to believe that it is formed when the Cholera discharges are in a certain stage of decomposition. When once formed it may enter the system either by the lungs in the

respired air, or by the mouth in the food or water, and in a certain proportion of cases, but not in all, it will produce an attack of Cholera which will be more or less severe according to the dose of the poison, its actively germinating condition, and the individual susceptibility of the person attacked.

Dr. Johnson follows up his theory by recommending castor oil as the proper remedy ; but it is difficult to imagine how a mild aperient, which simply passes rapidly through the bowels without entering the circulation, can be a means of purifying the blood and clearing the obstructed capillaries of the lungs, which, he says, keep back the poisoned blood from the excreting surface of the alimentary canal where alone, he says, it is freed from impurities.

In 1855 the General Board of Health published a report on the results of the different methods of treatment pursued in Epidemic Cholera in the various metropolitan hospitals, and, by means of a most careful but difficult classification, 2749 cases were arranged under various heads, the treatment analysed, and its issue reduced to averages ! The evidence of the tables collected and published in that report condemns the eliminant, or evacuant, treatment altogether as a principle of practice. It testifies against the stimulant principle, excepting as a resource in extreme cases. It displays a decided advantage in the alterative principle, especially as carried out by calomel and opium ; and it shows a still superior advantage in the astringent principle as applied through the means of chalk and opium—the general percentages of deaths following each plan of treatment being :—

Of eliminants . . . . .	71·7 per cent.
Stimulants . . . . .	54    ,,
Alteratives, calomel and opium . . . . .	36·2    ,,
Astringents, chalk and opium . . . . .	20·3    ,,

On the castor oil treatment the Medical Council of the Board of Health reported as follows :—"It appears that in eighty-nine cases of cholera treated by fourteen different practitioners with castor oil on the plan recommended by Dr. Johnson, sixty-eight were fatal, recovery having occurred only in fifteen cases, while the six remaining cases are still under treatment."

The report of the London College of Physicians also con-

demns evacuates as injurious in the stage of invasion, and useless in the stage of collapse. In a leading article of the *Lancet* of August 19th, 1871, I find the use of castor oil in Cholera is strongly condemned, and it is stated that "even in Dr. Johnson's hands in King's College Hospital, thirteen out of twenty-one cases died during the last epidemic."

It must be confessed that the treatment of Cholera has been as unsatisfactory as it has been unscientific and various. The most opposite methods have been tried with an equal want of success. Aperients and astringents; stimulants and sedatives; acids and alkalies; ice and hot baths; bleeding and transfusion of blood, or injection of hot saline solutions into the veins; galvanism, and the inhalation of oxygen gas, have each had their advocates, and have each failed to show any great or decided amount of success. Almost every notable medicine—mercury, arsenic, strychnine, chloroform, sulphur, iron, turpentine, prussic acid, quinine, charcoal, &c.—has been tried by way of experiment without resulting in the discovery of any specific remedy. Still it must not be supposed that all treatment is useless in Cholera, or even that it is useless in all the stages of collapse. *Treatment is most successful when commenced early, and before collapse sets in.* The medicine upon which most reliance can be placed is a dose of opium administered at an early stage of the disease. This may be combined with astringents and aromatic stimulants, as the majority of the most experienced practitioners strongly insist on the importance of arresting the diarrhœa. It would be advisable to support the patient with repeated doses of *strong* beef tea, made with lean meat cut very small, and *cold water*, to which a little salt and a few drops of muriatic acid should have been previously added; or Liebig's extract of meat may be used. A teaspoonful of pepsine wine may be given with the beef tea. Rest in a warm bed is essential, and a mustard poultice to the pit of the stomach is also of service. Calomel is said to have been found useful in checking the vomiting, but its utility is questionable. More benefit may be expected from effervescing saline medicines in small doses, frequently repeated. Quinine may be given with these draughts, and I should place more reliance upon it, than upon any other specific. Cold water and ice relieve thirst, are very grateful to the patient, and are not only the most acceptable, but probably the most useful of remedies throughout the

whole course of the disease. In the stage of collapse opium is injurious, stimulants are of little avail, and medicines generally are useless, because absorption is almost if not quite suspended, and if the medicines are retained in the stomach they may accumulate in such quantities as to prove injurious at a later period. Cold water and ice, frequently given in small quantities, favour reaction more than the most powerful stimulants. Ice-bags to the spine may be found more useful than hot baths. In the stage of reaction saline remedies, cold water, and a little liquid food, are the most appropriate treatment.

Amongst a variety of new remedies for Cholera, we shall probably see carbolic acid and chloralum recommended for internal use, and the application of ice-bags to the spine. I think the latter would be of use in arresting the vomiting, and chloralum might check the purging. I should feel disposed to try the pure chloride of aluminum (the basis of chloralum) as an antiseptic astringent. If I were to add to the long list of remedies by suggesting another—one which I believe has not yet been tried—it would be the officinal sulphurous acid in half-drachm doses, as it is a powerful antiseptic, and I have found it beneficial in obstinate vomiting. When absorption from the stomach has ceased, I think the injection of a solution of quinine under the skin would be a rational remedy. Other medicines might be introduced into the blood in the same way.

It is only right to admit that a wide difference of opinion exists among both Indian and British physicians with regard to the use of opium and of castor oil. Those who approve of the one condemn the use of the other. I believe the balance of opinion at present is largely in favour of opium, if not given in too large doses, and discontinued when the stage of collapse is impending. The best remedy may be injurious if not administered with discretion.

It is unnecessary for me to say more on this subject, as the management of each individual case must be left to the judgment of the medical practitioner who is watching it, and who will prescribe according to the stage of the disease and the effect of the remedies. I will only add this remark, *that far more medical skill is often displayed in knowing when to wait, and in doing nothing else, than in the active administration of useless and possibly injurious remedies.*

CHOLERAIC DIARRHŒA is probably the result of a mild dose of Cholera poison, and ought to be restrained by rest in bed, light digestible food, turpentine fomentations to the abdomen, and the use of opium combined with aromatic sulphuric acid, or with aromatic chalk mixture and astringents.

"Experience," says Dr. Gull, one of the first physicians of our day, "has abundantly shown that during the epidemic the stages from a mild and apparently simple diarrhœa to the rice-water purging and collapse are not definable, and that the former, if unchecked, does, in numerous instances, gradually pass into the latter, with its attendant collapse and fatal results."

I have said *there is no specific remedy for cholera. Those who survive the stage of decided collapse should be classed as recoveries rather than as cures.* The object of the simple treatment I have described is to gain time and allow nature to effect the cure, where that is possible, in her own way ; or, in other words, to adopt the most rational means of preventing the patient from dying during the process, or from the effects of the natural efforts to get rid of the poison, or, it may be, until the system becomes tolerant of its presence and capable of eliminating it, or decomposing it in a more gradual manner. The latter suggestion may help to account for secondary fever occurring after mild cases.

I have now arrived at the last and most important point of my lecture, namely, the consideration of those measures which science and experience have suggested as being most likely to be of service in preventing the occurrence or propagation of Cholera. Eminent writers on this subject have maintained the possibility of its arising from an air-borne poison, and its occasional outbreak in places lying in the direction of a wind blowing from an infected quarter, and the simultaneous occurrence of several cases in different parts of a city when cholera has first appeared tend to support this view. Other distinguished men have maintained that Cholera is mainly, if not exclusively, propagated by Cholera discharges having contaminated the drinking water. I have no doubt that this is a fruitful source of propagating the disease, but I do not think it accounts for the occurrence of all the cases, as, for instance, those which arise from the use of infected water-closets, or for the regular course and decline of the



epidemic, or for the different mortality in different districts having the same water supply. While it is quite possible that a number of individuals may be attacked, notwithstanding all the precautions which can possibly be taken, it is equally certain that a great number of cases will be prevented, and the mortality much reduced, by sanitary improvements—such as the avoidance of overcrowding, perfect drainage, removal or disinfection of putrefying animal or vegetable matters, the use of pure water, and the careful disinfection of *all* the discharges of a cholera patient and of *all* the utensils, articles of clothing, or bedding which may have been made use of about the case.

Impure air not only favours the preservation and diffusion of contagion germs, but may possibly act also in favouring their formation and multiplication. Specific diseases do not appear to be induced without the presence of a specific poison, but the habitual respiration of impure air undermines the general health, and renders the system more prone to receive, and less able to resist, the attacks of infectious diseases. Free ventilation of houses is consequently of the greatest importance. A good fire is of great use in promoting the circulation of air, but pure air should be admitted from the outside by means of open windows, and not through an inner door from the basement story of the house, where the air is most impure. Accumulations of decomposing animal and vegetable matters in the shape of filthy dustbins, &c., are not to be tolerated. All materials prone to decomposition should be burnt on the fire, and not thrown on the dust heap to decay. Household slops should never be thrown on the dust, but poured down the drain. Care is to be taken that closets, sinks, and drains are properly trapped, and that the traps are in good order, and the covers kept in their places. The free admission of sunlight—a matter which is seldom thought of—is very necessary in promoting a pure atmosphere, and making a room healthy and fit to live in. All courts and yards should be well paved as well as thoroughly drained.

If every available spot in London were planted with trees I believe the sanitary state of the metropolis would be much improved.

The next important point is pure water, and an ample



supply of it for all domestic purposes. The receptacles for water should be kept clean and covered. They should not be placed in the neighbourhood of offensive smells, as the poisonous gases are absorbed by the water. Filtered water alone should be used for drinking, and when there is any doubt about its quality it should also be boiled before being drunk. Avoid water which is not quite clear and without taste. Common pump water must be shunned as poison. Personal cleanliness, and temperance in eating and drinking, must not be neglected. Stimulants are no preventive against cholera, and intemperance is most injurious. Teetotalism, however, is no safeguard. When epidemic cholera is present, long fasting and over-fatigue should be avoided. A cup of hot coffee should be taken before going out in the morning. The daily use of a moderate quantity of common salt at each meal has been recommended as a preventive of cholera. I consider this suggestion worthy of being adopted. It can do no harm and is likely to do good. I believe salt will act *as salt* on the fluids of the body, and not as a vehicle for evolving chlorine in the stomach. Sleeping on the ground floor, or in the basement of a house, should be avoided, especially in low-lying districts. The bed-clothing should be sufficient to prevent any feeling of chilliness during the night, and those who do not wear a flannel under-shirt should wear a broad flannel belt round the abdomen. Saline aperients, as Epsom salts, or even Seidlitz powders, should not be taken. If there is any feeling of debility, flatulence, or indigestion, a little quinine with dilute nitro-hydrochloric acid would be a proper medicine, and should there be a tendency to looseness of the bowels a few drops of tincture of iron may be taken. As diarrhoea often begins early in the morning, it is wise to keep some suitable medicine in the house, and to take a dose as soon as attacked, pending the arrival of medical assistance. No symptom of diarrhoea should be neglected, and the evacuations should be disinfected by the addition of a tablespoonful of chloralum, or carbolic acid, or Burnett's disinfecting fluid. Some solution of chloralum or carbolic acid should also be poured down any closet which may have been used. A strong solution of sulphate of iron—the common green vitriol or copperas of the shops—in the proportion of a pound to a gallon of water—may also be used as a cheap disinfectant.

I would not advise the use of chloride of lime. If no other disinfectant is at hand, common soot may be used, and the offensive matters buried without delay.

When a case of Cholera has actually occurred in a house, free ventilation is necessary to dilute any poisonous matter which may be present in the atmosphere. The evacuations should be received in vessels containing a small quantity of chloralum, or Condy's red fluid. A solution of carbolic acid—half a pint to a pailful of hot water—may be used to wash the floor of the room. Linen, &c., may be disinfected by being set to soak in water containing, per gallon, an ounce of carbolic acid, or of Condy's red fluid, and afterwards, when at wash, being boiled in the washing water. Clothing which cannot be so treated may be purified by being exposed for two or three hours to a temperature between 212 deg. and 250 deg. Fah. Whatever cannot be purified should be burnt. The hands of the nurses and attendants about the sick should be washed in a solution of Condy's red disinfecting fluid—about a tablespoonful to a quart of water—before partaking of food. With regard to the propriety of removing a cholera patient, I think it is better and safer to remove the healthy than the sick, unless the later is placed under very unfavourable circumstances. I need scarcely repeat that *every utensil used by the patient, and all articles soiled by the discharges, must be carefully cleansed and disinfected without unnecessary delay, as the only known means of preventing the spread of the disease in the locality where a case has occurred.* Similar precautions should be taken in cases of supposed choleraic diarrhoea, as many of them are probably mild cases of cholera, and, if proper precautions are not taken they may be instrumental in causing more severe forms of the disease. For the purification of apartments (no longer occupied) by fumigation, I think the vapour of nitrous acid would be most effectual, but the fumes of sulphurous acid which are given off by burning an ounce or two of flowers of sulphur in a pipkin, would probably be equally efficacious, and the adoption of this means would be an easier matter for inexperienced persons, and therefore more suited for general use. Ceilings and walls of rooms should be washed with quick-lime water. Do not forget that no artificial disinfectants can supply the place of cleanliness, ventilation, and drainage.

Dr. Goodeve, an Indian surgeon of great experience, says, "In India the medical men, nurses, hospital coolies, sweepers, washers of soiled linen and bedding, and others who are constantly engaged about the sick, do not appear to be more liable than the rest of the population. The disease seldom spreads from bed to bed in the wards of a hospital. Infection does not seem to have arisen from the dead body, if we may judge from the impunity with which an immense number of *post mortem* examinations have been made, and the contents of the intestines submitted to all kinds of examination." Others have testified to the same facts. This immunity on the part of attendants on the sick has been attributed to the absence of fear, as mental depression unquestionably exercises a strong predisposing influence. *There is no just cause for alarm while paying proper attention to the sick. Indeed, the paying of proper attention to the sick is the best means of preventing the spread of cholera.* At the same time the number of cases of Cholera which have undoubtedly arisen from the diffusion of Cholera discharges in the air and in water are too numerous to admit of any question that the disease can be so communicated. Hence the necessity of the most thorough disinfection, and the most perfect cleanliness. In the event of Cholera again making its appearance amongst us, the adoption of the means I have pointed out will tend very much to limit the number of cases. I do not affirm that the relative mortality of those attacked will be diminished to the same extent. Should our country be spared another visitation of this mysterious disease our sanitary precautions will not have been labour in vain, but will materially contribute towards a diminution of the sickness and mortality arising from many other diseases which are never absent from our midst.

I cannot do better than conclude my lecture with a quotation from an excellent little book on Cholera, by Dr. Lankester.

"It is not by keeping the public in ignorance of the nature of this disease that any good can be done; but it is by imparting an intelligent apprehension of the great natural laws involved in the course and progress of this disease that we may hope to deprive it of its fatality, and even convert its awful presence into a future blessing."

## PRECAUTIONS AGAINST CHOLERA.

The following document has been issued by the Medical Department of the Privy Council Office :—

“ 1. As Asiatic Cholera is now prevailing in foreign ports within a week's voyage of this country, and may probably extend to others which have still quicker communication with England, it is not unlikely that, within the next month or two, occasional cases of the disease may be brought into the ports of this country.

“ 2. A recent Order of Council, dated July 29, has given power to the respective local authorities to deal with any such cases, if they arrive, in a way to protect the population, as far as practicable, against surprise. But as cases of choleraic infection have innumerable degrees of severity, it is possible that some such cases, slightly affected, will, notwithstanding the vigilance of local authorities, be landed without particular notice in English seaboard towns, whence then they may advance to other, and perhaps inland, places.

“ 3. Former experience of Cholera in England justifies a belief that the presence of imported cases of the disease at various spots in the country will not be capable of causing much injury to the population if the places receiving the infection have had the advantage of proper sanitary administration ; and, in order that all local populations may make their self-defence as effective as they can, it will be well for them to have regard to the present state of knowledge concerning the mode in which epidemics of Cholera (at least in this country) are produced.

“ Happily for mankind, Cholera is so little contagious, in the sense in which small-pox and scarlatina are commonly called contagious, that, if reasonable care be taken where it is present, there is scarcely any risk that the disease will spread to persons who nurse and otherwise closely attend upon the sick. But Cholera has a certain peculiar infectiveness of its own, which, where local conditions assist, can operate with terrible force, and at considerable distances from the sick. It is characteristic of Cholera, not only of the disease in its developed and alarming form, but equally of the slightest diarrhœa which the epidemic influence can cause,

that all matters which the patient discharges from his stomach and bowels are infective, and that, if they be left without disinfection after they are discharged, their infectiveness during some days gradually grows stronger and stronger. Probably, under ordinary circumstances, the patient has no power of infecting other persons, except by means of these discharges; nor any power of infecting even by them, except in so far as particles of them are enabled to taint the food, water, or air, which people consume. Thus, when a case of Cholera is imported into any place, the disease is not likely to spread, unless in proportion as it finds, locally open to it, certain facilities for spreading by indirect infection. In order rightly to appreciate what these facilities must be, the following considerations have to be borne in mind:—First, that any choleraic discharge cast without previous thorough disinfection into any cesspool or drain, or other depository or conduit of filth, infects the excremental matters with which it there mingles, and probably, to some extent, the effluvia which those matters evolve; secondly, that the infective power of choleraic discharges attaches to whatever bedding, clothing, towels, and like things have been imbued with them, and renders these things, if not thoroughly disinfected, as capable of spreading the disease in places to which they are sent (for washing or other purposes) as, in like circumstances, the Cholera patient himself would be; thirdly, that if, by leakage or soakage from cesspools or drains, or through reckless casting out of slops and wash-water, any taint (however small) of the infective material gets access to wells or other sources of drinking-water, it imparts to enormous volumes of water the power of propagating the disease. When due regard is had to these possibilities of indirect infection, there will be no difficulty in understanding that even a single case of Cholera, perhaps of the slightest degree, and perhaps quite unsuspected in its neighbourhood, may, if local circumstances co-operate, exert a terribly infective power on considerable masses of population.

“5. It might be supposed that under those provisions of the Sanitary Act, 1866, which relate to precautions against dangerous infections of disease, security could be taken, as regards the infective discharges of Cholera, against various kinds of personal conduct which would be dangerous to the

public health ; above all, that, under those provisions or otherwise, the universal disinfection of such discharges could be enforced. Undoubtedly everything possible in this direction ought to be done, wherever a case of Cholera is known to exist ; too much importance cannot be attached to the precaution of thoroughly disinfecting, without delay, all discharges from the stomach and bowels of persons suffering under the disease, as well as all bedding, clothing, towels, and the like, which such discharges may have imbued ; and of course neither choleraic discharges, nor any slops which may contain traces of them, should ever, even when supposed to be disinfected, be cast into any position from which they may get access into drinking water. The duty of observing those precautions is one which ought never to be neglected. But populations cannot prudently stake their lives on the chance that it will be completely fulfilled for them. Apart from all questions of negligence, the degrees of Cholera are too many, and the slight and incipient cases far too apt to escape observation, for any such defence against its infection to be more than partial. And the main object for endeavour must be to secure such local circumstances that Cholera-contagium, though not disinfected, shall be unable to act extensively on the population.

“ 6. The dangers which have to be guarded against as favouring the spread of Cholera-contagium are particularly two. First, and above all, there is the danger of water-supplies which are in any (even in the slightest) degree tainted by house refuse or other like kinds of filth ; as where there is outflow, leakage, or filtration from sewers, house-drains, privies, cesspools, foul ditches, or the like, into streams, springs, wells, or reservoirs from which the supply of water is drawn, or into the soil in which the wells are situate—a danger which may exist on a small scale (but, perhaps, often repeated in the same district) at the pump or dip-well of a private house, or on a large and even vast scale in the source of supply of public waterworks ; and, secondly, there is the danger of breathing air which is foul with effluvia from the same sorts of impurity. Information as to the high degree in which these two dangers affect the public health in ordinary times, and as to the special importance which attaches to them at times when any diarrhœal infection is likely to be introduced, has now for many years been

before the public, and the improved systems of refuse-removal and water-supply by which the dangers are permanently obviated for large populations, and also the minor structural improvements by which separate households are secured against the dangers, ought long ago to have come into universal use. So far, however, as this wiser course has not been adopted, temporary security must, as far as practicable, be sought in measures of a palliative kind.

(a) Immediate and searching examination of sources of water-supply should be made in all cases where the source is in any degree open to the suspicion of impurity, and the water, both from private and public sources, should be examined. Where pollution is discovered, everything practicable should be done to prevent the pollution from continuing, or, if this object cannot be attained, to prevent the water from being drunk. (b) Simultaneously there should be immediate thorough removal of every sort of house-refuse and other filth which has accumulated in neglected places; future accumulations of the same sort should be prevented; attention should be given to all defects of house-drains and sinks through which offensive smells are let into houses; thorough washing and lime-washing of uncleanly premises, especially of such as are densely occupied, should be practised again and again. (c) Disinfection should be very freely and very frequently employed in and round about houses, wherever there are receptacles or conduits of filth, wherever there is filth-sodden, porous earth, wherever anything else, in or under or about the house, tends to make the atmosphere foul. In the absence of permanent safeguards, no approach to security can be got without incessant cleansings and disinfections, or without extreme and constant vigilance against every possible contamination of drinking water. (For detailed advice on disinfection, see the office Memorandum on that subject.)

"7. In view of any possibility that the infection of Cholera may again be present in this country, it is desirable that in each locality the public should ascertain to whom it practically has to look, in case of need, for its collective safety against such dangers as the above. The responsibility is, in a large proportion of cases, mixed. The most critical of all its branches, the responsibility of providing for the unpol-



lutedness of water supplies, is in many very important places in the hands of commercial companies; and it is to be hoped that these companies, informed as they must be of the calamitous influence which some of their number have exerted in previous epidemics of Cholera, will remember, if the disease should again be present here, that each of them, in its daily distribution of water, has hundreds, or even thousands, of human lives in its hands. But, except to that extent, the responsibility for local defences against Cholera, both as regards water supply and as regards local cleanliness and refuse removal, is vested in the local authorities, the 'Sewer Authorities' and 'Nuisance Authorities' of recent statutes. These authorities—the Town Councils, Improvement Commissioners, Local District Boards, Boards of Guardians, and Select and Common Vestries, of their respective areas of jurisdiction—are all, either electively or directly, so constituted as to represent the will of the local ratepaying population; and each such population has had almost absolute means of deciding for itself whether the district which it inhabits shall be wholesomely or unwholesomely kept. It is greatly to be wished that the former of these alternatives had, from long ago, been the desire of every local constituency in the country. It may fairly be believed that, in considerable parts of the country, conditions favourable to the spread of Cholera are far less abundant than at former times of visitation; but it is certain that in very many places the conditions of security are wholly or almost wholly absent; and it is to be hoped that in all this large class of cases the authorities under present circumstances will do everything which in the remaining time can be done to justify the trust reposed in them by the Legislature for the protection of the public health.

"8. It is important for the public very distinctly to remember that pains taken and costs incurred for the purposes to which this Memorandum refers cannot in any event be regarded as wasted trouble and expense. The local conditions which would enable Cholera, if imported, to spread its infection in this country, are conditions which day by day, in the absence of Cholera, create and spread other diseases—diseases which, as being never absent from this country, are in the long run far more destructive than Cholera; and the sanitary improvements which would justify a sense of security



against any apprehended importation of Cholera would, to their extent, though Cholera should never reappear in England, give amply remunerative results in the prevention of those other diseases.—By direction of the Lords of the Council.

(Signed) "JOHN SIMON.

"Medical Department of the Privy Council Office,  
August 10, 1871."

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#### ON DISINFECTION.

The following valuable Minute on Disinfection has lately been circulated in Oxford:—

"Rooms can be disinfected by burning brimstone in them. Doors, chimneys, and windows must be shut whilst this is being done; and any clothes or carpets belonging to such rooms may, previously to further disinfection (for which see below), be with advantage spread out on ropes in such rooms during the process. No disinfection of this kind is thorough if a man can live in the room whilst it is going on.

"Water-closets, privies, cesspools, and drains can be disinfected by copperas (sulphate of iron). Carbolic acid can be used with advantage in company with, or after, but not without copperas. A certain quantity of disinfectant will disinfect only a certain quantity of foul matter, and disinfection is imperfect till all "hot" smell or alkaline reaction is abolished. For the disinfection of a cubic foot of filth half a pound of copperas dissolved in a couple of quarts of soft water is sufficient. The daily addition by each individual using a privy or water-closet of two-thirds of an ounce of solid copperas to such privy, or one-third of a pint of the above solution to such water-closet, will keep it wholesome if any accumulation of filth which it may contain or may communicate with has been previously disinfected according to the directions given above. Carbolic acid, which need not be chemically pure, can be used after the addition of cop-

peras till the place smells strongly of it. It should be used in the fluid state, its combinations with lime and magnesia having an alkaline reaction, and being therefore unsuitable for the present purpose. It may be diluted by being shaken up with twenty times its volume of water, and if poured from a watering-pot with a rose-nozzle over the sides of a recently emptied privy or cesspool will do great good. Sawdust or sand, strongly impregnated with carbolic acid, may be used for this purpose. Chloralum (solution of chloride of aluminium of sp. gr. 1160) will acidify ordinary sewage and destroy its living organisms when added in the proportion of one part to forty. It may be expected, therefore, to act as a disinfectant. This cannot be said of chloride of lime. All water-closets and privies should, when epidemics of cholera or typhoid may be expected, be disinfected, whether they be offensive or not. It is well at such periods to avoid using any such conveniences which have not been disinfected, especially if, as at hotels and railway stations, they may have been used by persons from infected localities. All the conveniences mentioned need ventilating as much as living-rooms do.

"Body and bed-clothes should be disinfected either by immersion in Burnett's solution (of chloride of zinc), diluted in the proportion of a pint to a gallon of water, and kept in a glazed earthenware vessel, or by prolonged boiling.

"Woollen clothes may be disinfected in an oven by a temperature of 250 deg. Fah.

"It is well to *burn* anything infectious which we can afford to burn."

